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## Long-Term Follow-up of Modular Metallic Radial Head Replacement

*Commentary on an article by Jonathan P. Marsh, MD, FRCSC, et al.: "Radial Head Fractures Treated with Modular Metallic Radial Head Replacement: Outcomes at a Mean Follow-up of Eight Years"*

Pierre Mansat, MD, PhD

Radial head arthroplasty is used to stabilize the joint after a complex acute radial head fracture that is not amenable for fixation or to treat sequelae of radial head fractures. Most of the currently used radial head prostheses are metallic monoblock implants that are not consistently adaptable and raise technical challenges since their implantation requires lateral elbow subluxation. Metallic modular radial head arthroplasty implants available in various head and stem sizes have been developed to improve adaptability and facilitate implantation. Bipolar radial head arthroplasty implants were developed to improve articular tracking of the prosthesis on the capitellum.

Previously published studies do not allow comparisons across implants, as no comparative studies are available and indications vary with each type of implant. A meta-analysis of the published case series suggested that the outcomes are satisfactory for 81% of patients managed in the acute setting and for 73% of those managed at the stage of sequelae, after a mean follow-up of three to four years<sup>1</sup>. The outcomes do not seem to differ significantly for monoblock prostheses (50% to 94% with satisfactory outcomes), modular prostheses with a fixed radial head (61% to 97% with satisfactory outcomes), and bipolar radial head arthroplasty implants (50% to 100% with satisfactory outcomes).

The most common complications are related to loosening regardless of whether the radial head implants are inserted with or without cement<sup>1</sup>. Hypotheses regarding the causes of loosening that have been proposed include inadequate stem design, insufficient cementing technique, stress-shielding, and foreign-body reaction secondary to polyethylene wear. Other complications include pain and stiffness, which often occur in relation to an oversized radial head component or overstuffing of the joint with excessive lengthening of the radius. Instability can also develop in cases involving more complex trauma with lateral ulnar collateral ligament complex disruption and coronoid fracture. Osteoarthritis is commonly seen during the course of follow-up.

The originality of this retrospective single-center study was its clinical and radiographic evaluation of radial head arthroplasties with a smooth-stemmed modular metallic implant performed for acute radial head fractures at a minimum of five years (mean, eight years) postoperatively. The implant was inserted into the bone without cement and it was not designed for bone ingrowth, as the stem was free in the medullary canal. The design is intended to permit forearm rotation around the stem, rather than between the implant and the capitellar articular surface. Modular radial head prostheses allow the surgeon to match as closely as possible the size of the fractured radial head. However, this implant was designed without a bipolar mechanism. Indications were an isolated unreconstructible radial head fracture or one that was associated with other lesions such as ligamentous injuries, coronoid fracture, olecranon fracture, or distal humeral fracture. Fifty-five patients with a mean age of sixty-one years returned for follow-up at a mean of eight years postoperatively.

The Mayo Elbow Performance Index (MEPI) results were satisfactory for forty-five (86.5%) of the fifty-two patients evaluated. The mean Short Form-12 scores, the QuickDASH (an abbreviated form of the Disabilities of the Arm, Shoulder and Hand questionnaire), and the Patient-Rated Elbow Evaluation scores were all within the normal range. However, patients lost range of motion in flexion-extension and pronation-supination compared with the unaffected elbow. The affected extremity was also significantly weaker in elbow flexion and extension. At the time of final follow-up, no implant had been removed or revised, resulting in an implant survival rate of 100% at a minimum of five years. However, there were periprosthetic radiolucencies in 45% of the patients. Ulnohumeral arthritis was present in 38% of the patients, and heterotopic ossification was observed in 36% of the patients, without significant functional impairment in the majority of those affected. Capitellar osteopenia was observed in 22% of the patients, and an abnormal radiocapitellar alignment was noted in only one patient. Evaluating the cases of a subgroup of thirty-three patients reviewed at mean follow-up intervals of two years and eight years, the authors showed that there was no apparent functional deterioration from short-term to longer-term follow-up.

We are aware of few other studies in the literature with a mean follow-up of eight years or greater. Harrington et al. reported that mild stem radiolucencies were common at a mean of twelve years with a smooth-stemmed monoblock metallic implant; four

of twenty implants required removal for elbow pain<sup>2</sup>. Popovic et al., using a cemented bipolar radial head implant, found that thirty-seven of fifty-one patients had evidence of progressive osteolysis at the bone-cement interface, but none required revision at a mean follow-up of 8.4 years<sup>3</sup>. Most patients had minimal pain until the osteolysis became severe. Those authors advised that cemented bipolar implants be used with caution. Burkhart et al., who used the same bipolar cemented radial head prosthesis, found no evidence of loosening, radiolucencies, or proximal bone resorption at a mean follow-up of 8.8 years<sup>4</sup>. The main complication was degenerative changes. Finally, Shore and al. reviewed the cases of thirty-two patients who had radial head arthroplasties with a metallic implant performed for chronic posttraumatic elbow disorders; twenty-two had received a monoblock prosthesis and ten, a modular implant<sup>5</sup>. At the time of follow-up, 74% of the patients had some degree of posttraumatic arthritis. There were no significant differences in ulnar variance or in the ulnohumeral joint space width between the affected and unaffected arms. At the time of the final follow-up, no metallic radial head replacement had been revised.

The weakness of the current study is related to its retrospective design and to the loss to follow-up of 18%. The study population also may not be representative of a typical orthopaedic practice because of the specific recruitment of this center. However, we can conclude from this study that radial head arthroplasty with a smooth-stemmed metallic modular implant inserted without cement is a good treatment option for patients with acute unreconstructible radial head fractures and it provides reliable clinical and radiographic outcomes from five years to fourteen years postoperatively.

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